

WHAT IS CLAIMED IS:

1. An electro-luminescent device, said electro-luminescent device comprising:

a) at least one electrode; and

b) an electro-luminescent layer disposed on said at least one electrode, wherein said electro-luminescent layer comprises an electro-luminescent polymeric material, and wherein said electro-luminescent layer has a first pattern disposed on a surface adjacent to said at least one electrode and has a substantially uniform thickness.

2. The electro-luminescent device according to Claim 1, further comprising at least one conductive layer disposed between said at least one electrode and said electro-luminescent layer.

3. The electro-luminescent device according to Claim 2, wherein said at least one conductive layer has a second pattern disposed on a surface adjacent to said first pattern.

4. The electro-luminescent device according to Claim 3, wherein said first pattern is identical to said second pattern.

5. The electro-luminescent device according to Claim 2, wherein said at least one conductive layer comprises at least one of poly (3,4-ethylenedioxythiophene), poly (3,4-propylenedioxythiophene), polystyrenesulfonate, polyvinylcarbazole, and combinations thereof.

6. The electro-luminescent device according to Claim 1, wherein said electro-luminescent device is an organic light emitting diode.

7. The electro-luminescent device according to Claim 1, wherein said at least one electrode comprises at least one of a metal, indium tin oxide, silicon, and combinations thereof.

8. The electro-luminescent device according to Claim 1, wherein said first pattern comprises at least one coated portion, said at least one coated portion comprising an electro-luminescent material and having a coated surface area and at least one uncoated portion having an uncoated surface area, wherein said at least one uncoated portion intersects said coated portion to form a first coated area and a second coated area.

9. The electro-luminescent device according to Claim 8, wherein said coated surface area is greater than said uncoated surface area.

10. The electro-luminescent device according to Claim 8, wherein said at least one uncoated portion comprises at least one channel cut through said at least one coated portion, wherein said at least one channel has a channel width and a plurality of walls defining a boundary region, said boundary region having a boundary width.

11. The electro-luminescent device according to Claim 10, wherein said boundary width is less than about 20% of said channel width.

12. The electro-luminescent device according to Claim 8, wherein said coated portion has a thickness in a range from about 25 nm to about 150 nm.

13. The electro-luminescent device according to Claim 1, wherein said electro-luminescent polymeric material comprises at least one of a polyfluorene, a polyphenylene, a poly para-(phenylenevinylene), and combinations thereof.

14. The electro-luminescent device according to Claim 2, wherein said conductive layer comprises at least one of poly (3,4-ethylenedioxythiophene), and poly (3,4-propylenedioxythiophene), and combinations thereof.

15. The electro-luminescent device according to Claim 1, wherein said at least one electrode is supported by a substrate, wherein said substrate comprises at least one of a polycarbonate, a polyolefin, a polyester, a polyimide, a polysulfone, an acrylate, glass, a metal foil, and combinations thereof.

16. An electro-luminescent layer for an electro-luminescent device, said electro-luminescent layer comprising an electro-luminescent polymeric material, wherein said layer is patterned and has a substantially uniform thickness, and wherein said electro-luminescent layer is formed by forming a continuous sheet of said electro-luminescent polymeric material and removing a portion of said continuous sheet by wiping a surface of said continuous sheet in a direction that is tangential to said surface.

17. The electro-luminescent layer according to Claim 16, wherein said electro-luminescent layer is disposed adjacent to at least one conductive layer.

18. The electro-luminescent layer according to Claim 16, wherein said pattern comprises at least one coated portion having a coated surface area and at least one uncoated portion having an uncoated surface area, wherein said at least one uncoated portion intersects said coated portion to form a first coated area and a second coated area.

19. The electro-luminescent layer according to Claim 18, wherein said coated surface area is greater than said uncoated surface area.

20. The electro-luminescent layer according to Claim 18, wherein said at least one uncoated portion comprises at least one channel cut through said at least one coated portion, wherein said at least one channel has a channel width and a plurality of walls defining a boundary region, said boundary region having a boundary width.

21. The electro-luminescent layer according to Claim 20, wherein said boundary width is less than about 20% of said channel width.

22. The electro-luminescent layer according to Claim 20, wherein said coated portion has a thickness in a range from about 50 nm to about 150 nm.

23. The electro-luminescent layer according to Claim 16, wherein said electro-luminescent polymeric material comprises at least one of a conjugated polymer, polyfluorene, polyphenylene, poly para-(phenylenevinylene), and combinations thereof.

24. The electro-luminescent device according to Claim 17, wherein said at least one conductive layer comprises at least one of poly (3,4-ethylenedioxythiophene), and poly (3,4-propylenedioxythiophene), and combinations thereof.

25. The electro-luminescent layer according to claim 16, wherein said continuous sheet is formed by applying a polymeric film to a substrate, patterning said polymeric film, baking said polymeric film at a predetermined temperature, coating the polymeric film with an electro-luminescent material to form said electro-luminescent layer, and patterning said electro-luminescent layer.

26. The electro-luminescent layer according to claim 16, wherein said portion of said continuous sheet is removed by wiping said surface of said continuous sheet with a wiping head.

27. The electro-luminescent layer according to claim 26, wherein said wiping head, comprises at least one of a sponge, an elastomer, a thermoplastic, a thermoset, a fiber mat, a porous material, polyurethane rubber, synthetic rubber, natural rubber, silicones, polydimethylsiloxane, textured materials, and combinations thereof.

28. An electro-luminescent device, said electro-luminescent device comprising:

a) at least one electrode;

b) an electro-luminescent layer, said electro-luminescent layer comprising an electro-luminescent polymeric material, wherein said layer is patterned and has a substantially uniform thickness, and wherein said electro-luminescent layer is formed by forming a continuous sheet of said electro-luminescent polymeric material and removing a portion of said continuous sheet by wiping a surface of said continuous sheet in a direction that is tangential to said surface; and

c) at least one conductive layer disposed between said at least one electrode and said electro-luminescent layer.

29. The electro-luminescent device according to Claim 28, wherein said at least one conductive layer has a second pattern disposed on a surface adjacent to said first pattern.

30. The electro-luminescent device according to Claim 29, wherein said first pattern is identical to said second pattern.

31. The electro-luminescent device according to Claim 28, wherein said electro-luminescent device is an organic light emitting diode.

32. The electro-luminescent device according to Claim 28, wherein said at least one electrode comprises at least one of a metal, indium tin oxide, silicon, and combinations thereof.

33. The electro-luminescent device according to Claim 28, wherein said at least one conductive layer comprises at least one of poly (3,4-ethylenedioxythiophene), poly (3,4-propylenedioxythiophene), polystyrenesulfonate, polyvinylcarbazole, and combinations thereof.

34. The electro-luminescent device according to Claim 28, wherein said first pattern comprises at least one coated portion having a coated surface area and at least one uncoated portion having an uncoated surface area, wherein said at least one uncoated portion intersects said coated portion to form a first coated area and a second coated area.

35. The electro-luminescent device according to Claim 34, wherein said coated surface area is greater than said uncoated surface area.

36. The electro-luminescent device according to Claim 34, wherein said at least one uncoated portion comprises at least one channel cut through said at least one coated portion, wherein said at least one channel has a channel width and a plurality of walls defining a boundary region, said boundary region having a boundary width.

37. The electro-luminescent device according to Claim 36, wherein said boundary width is less than about 20% of said channel width.

38. The electro-luminescent device according to Claim 34, wherein said coated portion has a thickness in a range from about 50 nm to about 150 nm.

39. The electro-luminescent device according to Claim 28, wherein said electro-luminescent polymeric material comprises at least one of a conjugated polymer, polyfluorene, polyphenylene, poly para-(phenylenevinylene), and combinations thereof.

40. The electro-luminescent device according to Claim 29, wherein said at least one conductive layer comprises at least one of poly (3,4-ethylenedioxythiophene), and poly (3,4-propylenedioxythiophene), and combinations thereof.

41. The electro-luminescent device according to claim 28, wherein said continuous sheet is formed by applying a polymeric film to a substrate, patterning said polymeric film, baking said polymeric film at a predetermined temperature, coating the polymeric film with an electro-luminescent material to form said electro-luminescent layer, and patterning said electro-luminescent layer.

42. The electro-luminescent device according to claim 28, wherein said portion of said continuous sheet is removed by wiping said surface of said continuous sheet with a wiping head.

43. The electro-luminescent device according to claim 42, wherein said wiping head comprises at least one of a sponge, an elastomer, a thermoplastic, a thermoset, a fiber mat, a porous material, polyurethane rubber, synthetic rubber, natural rubber, silicones, polydimethylsiloxane, textured materials, and combinations thereof.

44. A light source, said light source comprising a plurality of electro-luminescent devices, wherein each of said electro-luminescent devices comprises:

- a) at least one electrode;

b) an electro-luminescent layer, said electro-luminescent layer comprising an electro-luminescent polymeric material, wherein said layer is patterned and has a substantially uniform thickness, and wherein said electro-luminescent layer is formed by forming a continuous sheet of said electro-luminescent polymeric material and removing a portion of said continuous sheet by wiping a surface of said continuous sheet in a direction that is tangential to said surface at least one conductive layer disposed between said at least one electrode and said electro-luminescent layer; and

c) at least one conductive layer disposed between said at least one electrode and said electro-luminescent layer.

45. The light source according to Claim 44, wherein said at least one conductive layer has a second pattern disposed on a surface adjacent to said first pattern.

46. The light source according to Claim 44, wherein said first pattern is identical to said second pattern.

47. The light source according to Claim 44, wherein said electro-luminescent device is an organic light emitting diode.

48. The light source according to Claim 43, wherein said at least one electrode comprises at least one of a metal, indium tin oxide, silicon, and combinations thereof.

49. The light source according to Claim 44, wherein said at least one conductive layer comprises at least one of poly (3,4-ethylenedioxythiophene), poly (3,4-propylenedioxythiophene), polystyrenesulfonate, polyvinylcarbazole, and combinations thereof.

50. The light source according to Claim 44, wherein said first pattern comprises at least one coated portion having a coated surface area and at least one uncoated portion having an uncoated surface area, wherein said at least one uncoated

portion intersects said coated portion to form a first coated area and a second coated area.

51. The light source according to Claim 50, wherein said coated surface area is greater than said uncoated surface area.

52. The light source according to Claim 50, wherein said at least one uncoated portion comprises at least one channel cut through said at least one coated portion, wherein said at least one channel has a channel width and a plurality of walls defining a boundary region, said boundary region having a boundary width.

53. The light source according to Claim 52, wherein said boundary width is less than about 20% of said channel width.

54. The light source according to Claim 50, wherein said coated portion has a thickness in a range from about 50 nm to about 150 nm.

55. The light source according to Claim 44, wherein said electro-luminescent polymeric material comprises at least one of a conjugated polymer, polyfluorene, polyphenylene, poly para-(phenylenevinylene), and combinations thereof.

56. The light source according to Claim 44, wherein said at least one conductive layer comprises at least one of poly (3,4-ethylenedioxythiophene), and poly (3,4-propylenedioxythiophene), and combinations thereof.

57. The light source according to claim 44, wherein said continuous sheet is formed by applying a polymeric film to a substrate, patterning said polymeric film, baking said polymeric film at a predetermined temperature, coating the polymeric film with an electro-luminescent material to form said electro-luminescent layer, and patterning said electro-luminescent layer.

58. The light source according to claim 52, wherein said portion of said continuous sheet is removed by wiping said surface of said continuous sheet with a wiping head.

59. The light source according to claim 68, wherein said wiping head comprises at least one of a sponge, an elastomer, a thermoplastic, a thermoset, a fiber mat, a porous material, polyurethane rubber, synthetic rubber, natural rubber, silicones, polydimethylsiloxane, textured materials, and combinations thereof.

60. The light source according to claim 44, wherein said electro-luminescent devices are identical to each other.

61. A method of selectively removing at least one coating from a surface of the substrate, the method comprising the steps of:

a) providing the substrate, the substrate having the at least one coating disposed on the surface;

b) contacting a portion of the at least one coating with a wiping head;
and

c) wiping the portion with the wiping head in a direction that is tangential to the surface to remove the portion of the at least one coating from the substrate.

62. The method according to Claim 61, wherein the at least one coating is a wet coating.

63. The method according to Claim 61, wherein the at least one coating is a dry coating.

64. The method according to Claim 61, wherein the at least one coating has been baked onto the surface of the substrate.

65. The method according to Claim 61, wherein the wiping head is a dry wiping head.

66. The method according to Claim 61, wherein the wiping head is moistened with a solvent.

67. The method according to Claim 77, wherein the solvent is at least one of water, methanol, ethanol, isopropanol, acetone, toluene, xylene, and combinations thereof.

68. The method according to Claim 61, wherein the wiping head is moistened by injecting the solvent into the head while the head wipes the portion of the at least one coating.

69. The method according to Claim 61, wherein the wiping head comprises at least one of a sponge, an elastomer, a thermoplastic, a thermoset, a fiber mat, a porous material, polyurethane rubber, synthetic rubber, natural rubber, silicones, polydimethylsiloxane, a textured material, and combinations thereof.

70. The method according to Claim 61, wherein the wiping head is a fixed head.

71. The method according to Claim 61, wherein the wiping head is movable with respect to the substrate.

72. The method according to Claim 61, wherein the wiping head is rotatable.

73. The method according to Claim 83, wherein the wiping head is a rotatable wheel.

74. The method according to Claim 61, wherein the step of tangentially contacting a portion of the at least one coating with a wiping head comprises tangentially contacting a portion of the at least one coating with a contact surface of the wiping head, wherein the contact surface has a predetermined structure.

75. The method according to Claim 91 wherein the predetermined structure comprises a plurality of protrusions for applying concentrated force to the surface.

76. The method according to Claim 74, wherein the predetermined structure comprises at least one prism, the at least one prism having a predetermined angle.

77. The method according to Claim 76, wherein the predetermined angle is about 90°.

78. The method according to Claim 76, wherein the predetermined structure comprises a plurality of prisms, wherein the plurality of prisms are separated from each other by a predetermined pitch.

79. The method according to 78, wherein the pitch is about 50 microns.

80. The method according to Claim 76, wherein the at least one prism has a trapezoidal profile.

81. The method according to Claim 76, wherein the at least one prism has a rounded tip.

82. The method according to Claim 76, wherein the at least one prism has a pointed tip.

83. The method according to Claim 74, wherein the contact surface further includes at least one sidewall disposed on at least one edge of the contact surface.

84. The method according to Claim 61, further including the step of premoistening the portion prior to wiping the portion with the wiping head.

85. The method according to claim 84, further including the step of premoistening the portion with a vapor solvent.

86. The method according to claim 84, further including the step of premoistening the portion with a liquid solvent.

87. The method according to claim 84, further including the step of premoistening a selected area of the coating.

88. The method according to claim 84, further including the step of premoistening the complete area of the coating.

89. The method according to Claim 61, wherein the step of wiping the portion with the wiping head to remove the portion of the at least one coating from the substrate comprises translating the substrate in a predetermined direction with respect to the wiping head.

90. The method according to Claim 89, wherein the wiping head wipes the portion in a direction parallel to the predetermined direction.

91. The method according to Claim 89, wherein the wiping head wipes the portion in a direction other than parallel to the predetermined direction.

92. The method according to Claim 61, wherein the step of providing the substrate comprises providing a continuous sheet of the substrate.

93. The method according to Claim 92, wherein the step of providing a continuous sheet of the substrate comprises providing a continuous sheet of the substrate from a supply roll.

94. The method according to Claim 92, further including the step of collecting the continuous sheet on a take-up roll.

95. The method according to Claim 61, wherein the step of wiping the portion with the wiping head further comprises a continuous wiping.

96. The method according to Claim 61, wherein the step of wiping the portion with the wiping head further comprises an intermittent wiping.

97. The method according to Claim 61, wherein the substrate comprises at least one of a microelectronic device, a photovoltaic cell, a thin film transistor, electronic paper, electronic display, a photonic device, a waveguide, a microelectromechanical system (MEMS), and a microfluidic device.

98. An apparatus for selectively removing at least one coating from a surface of a substrate, the apparatus comprising:

- a) a means for supplying the substrate having the at least one coating;

b) a wiping head for removing a portion of the at least one coating, wherein the wiping head tangentially contacts the at least one coating; and

c) a means for collecting the substrate after removing the portion.

99. The apparatus according to Claim 98, wherein the means for supplying the substrate comprises a means for supplying a continuous sheet of the substrate.

100. The apparatus according to Claim 99, wherein the means for supplying a continuous sheet of the substrate comprises a means for supplying the continuous sheet in rolled form.

101. The apparatus according to Claim 100, wherein the means for collecting the substrate comprises a means for taking up the continuous sheet in rolled form.

102. The apparatus according to Claim 98, wherein the wiping head is a dry wiping head.

103. The apparatus according to Claim 98, wherein the wiping head is moistened with a solvent.

104. The apparatus according to Claim 103, wherein the solvent is one of water, methanol, ethanol, isopropanol, acetone, toluene, xylene, and combinations thereof.

105. The apparatus according to Claim 98, wherein the wiping head is moistened by injecting the solvent into the head while the head wipes the portion of the at least one coating.

106. The apparatus according to Claim 98, wherein the wiping head comprises at least one of a sponge, an elastomer, a thermoplastic, a thermoset, a fiber mat, a porous material, polyurethane rubber, synthetic rubber, natural rubber, silicones, polydimethylsiloxane, textured materials, and combinations thereof.

107. The apparatus according to Claim 98, wherein the wiping head is a fixed head.

108. The apparatus according to Claim 98, wherein the wiping head is movable with respect to the substrate.

109. The apparatus according to Claim 98, wherein the wiping head is rotatable.

110. The apparatus according to Claim 109, wherein the wiping head is a rotatable wheel.

111. The apparatus according to Claim 98, wherein the wiping head tangentially contacts a portion of the at least one coating with a contact surface of the wiping head, wherein the contact surface has a predetermined geometry.

112. The apparatus according to Claim 111, wherein the predetermined structure comprises at least one prism, the at least one prism having a predetermined angle.

113. The apparatus according to Claim 112, wherein the predetermined angle is about 90°.

114. The apparatus according to Claim 112, wherein the predetermined structure comprises a plurality of prisms, wherein the plurality of prisms are separated from each other by a predetermined pitch.

115. The apparatus according to Claim 114, wherein the pitch is about 50 microns.

116. The apparatus according to Claim 112, wherein the at least one prism has a trapezoidal profile.

117. The apparatus according to Claim 112, wherein the contact surface further includes at least one sidewall disposed on at least one edge of the contact surface.

118. The apparatus according to Claim 98, further including a means for premoistening the portion prior to wiping the portion with the wiping head.

119. The apparatus according to Claim 118, wherein the means for premoistening comprises a nozzle that directs one of a premoistening liquid and a premoistening vapor onto the portion prior to contact of the portion by the wiping head.

120. The apparatus according to Claim 98, wherein the means for supplying the substrate supplies the substrate by translating the substrate in a predetermined direction with respect to the wiping head.

121. The apparatus according to Claim 120, wherein the wiping head wipes the portion in a direction parallel to the predetermined direction.

122. The apparatus according to Claim 120, wherein the wiping head wipes the portion in direction other than parallel to the predetermined direction.

123. A wiping head for removing a portion of at least one coating disposed on a surface of a substrate, the wiping head comprising a contact surface for contacting and removing the portion, wherein the contact surface tangentially contacts the portion, wherein the contact surface has a predetermined structure.

124. The wiping head according to Claim 123, wherein the predetermined structure comprises at least one prism, the at least one prism having a predetermined angle.

125. The wiping head according to Claim 124, wherein the predetermined angle is about 90°.

126. The wiping head according to Claim 124, wherein the predetermined structure comprises a plurality of prisms, wherein the plurality of prisms are separated from each other by a predetermined pitch.

127. The wiping head according to Claim 126, wherein the pitch is about 50 microns.

128. The wiping head according to Claim 124, wherein the at least one prism has a trapezoidal profile.

129. The wiping head according to Claim 123, wherein the contact surface further includes at least one sidewall disposed on at least one edge of the contact surface.

130. The wiping head according to Claim 123, wherein the wiping head is fixed.

131. The wiping head according to Claim 123, wherein the wiping head is rotatable.